

Applicant: Naoki WATANABE

Title: Method and Apparatus for Copying and Backup in Storage...

Atty Docket No. 16869B-077300US

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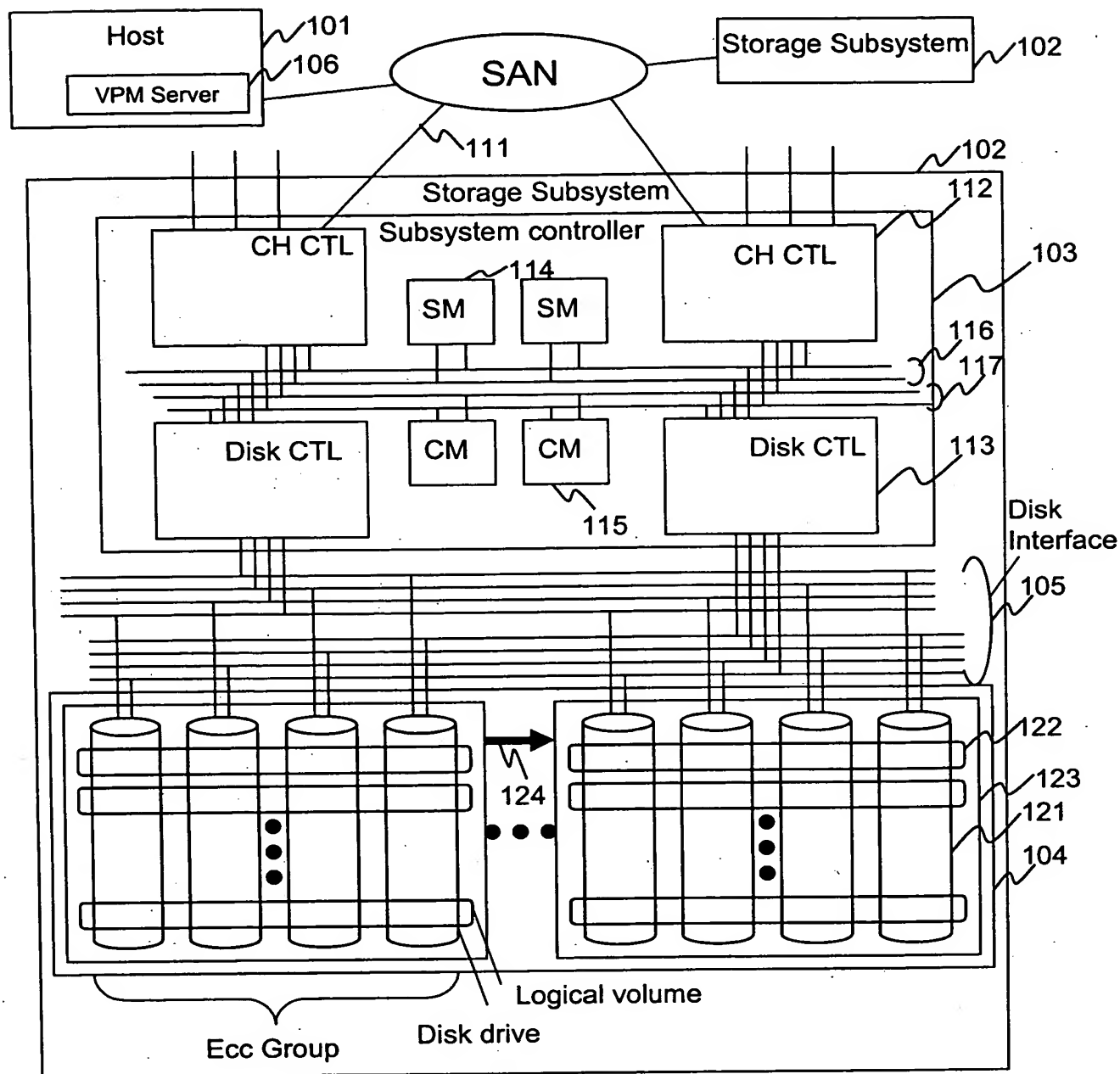


Figure 1 System Configuration

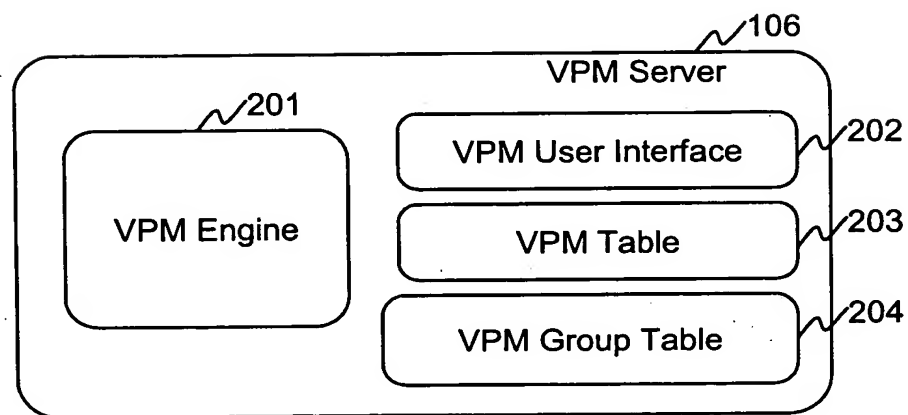
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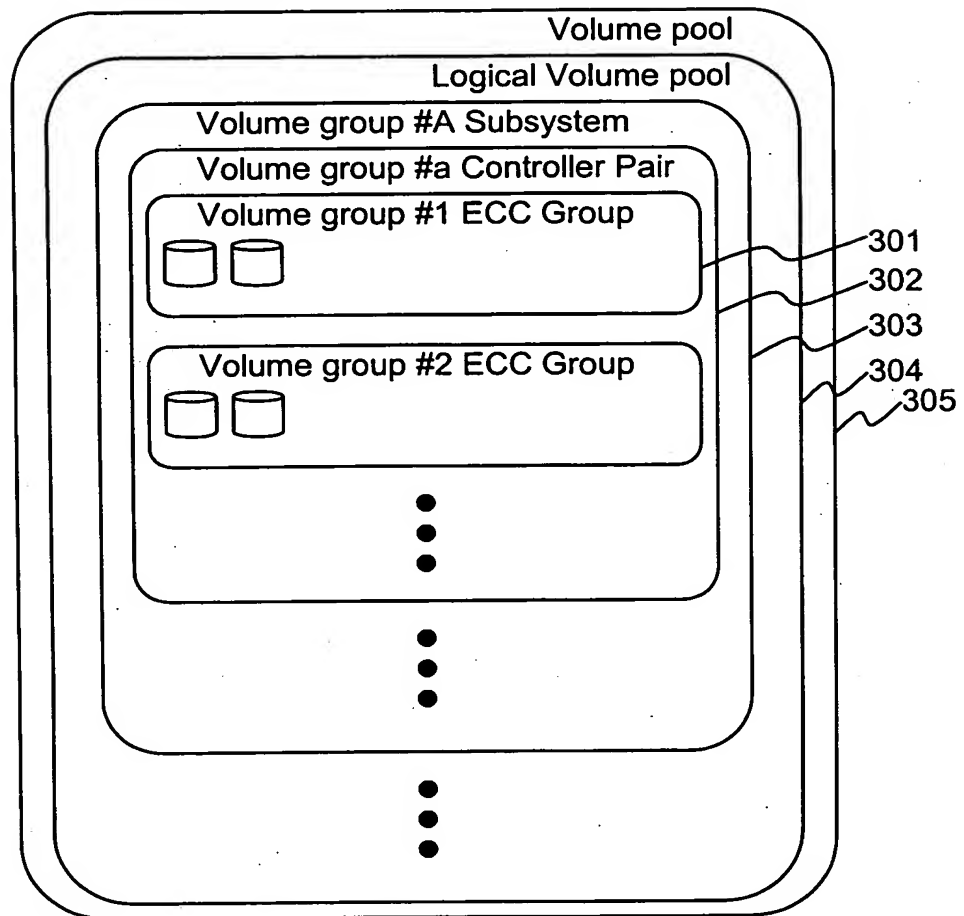
Figure 2 VPM Server

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Logical Volume pool: Site , department etc.

Figure 3 Logical View

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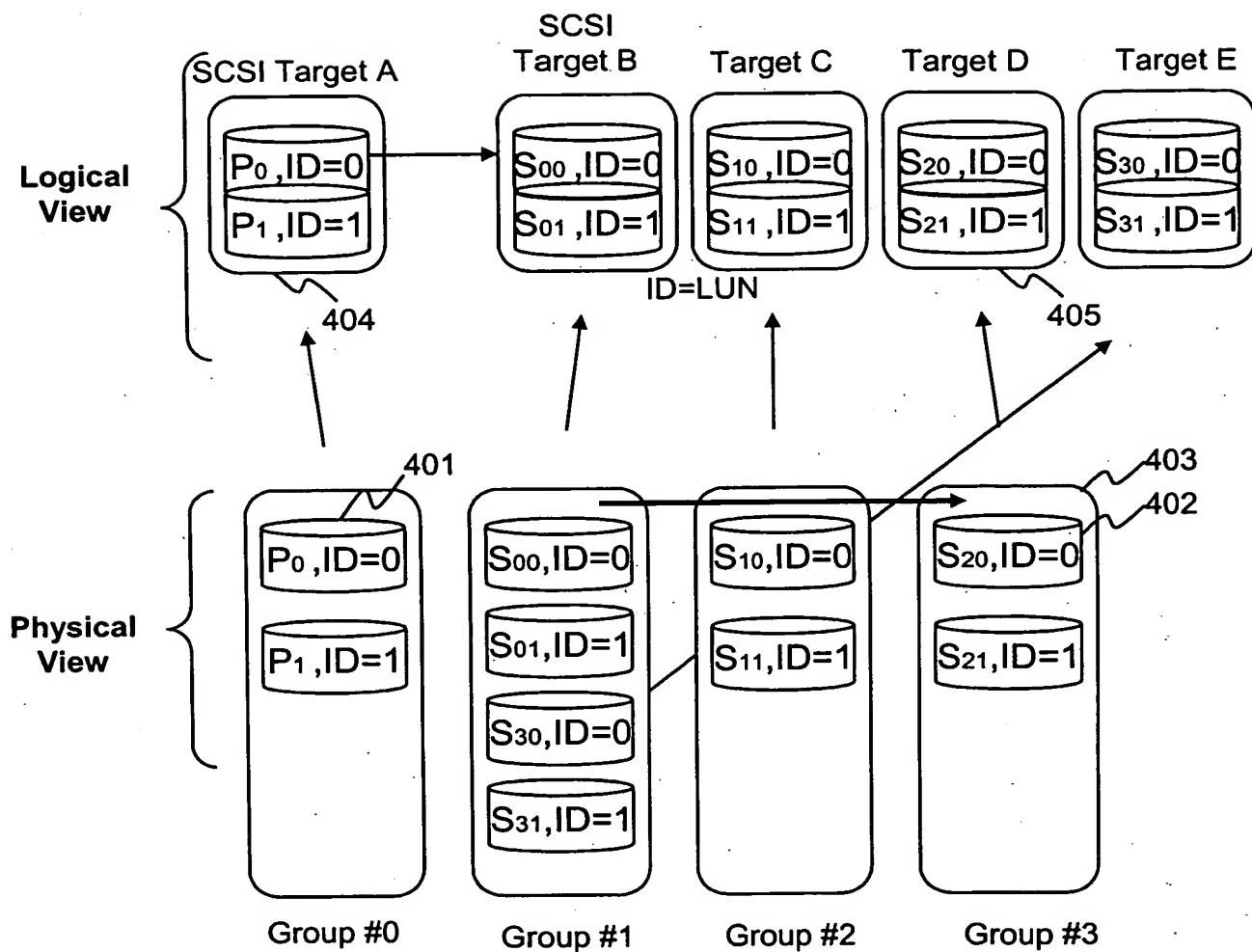


Figure 4 Layout - Horizontal

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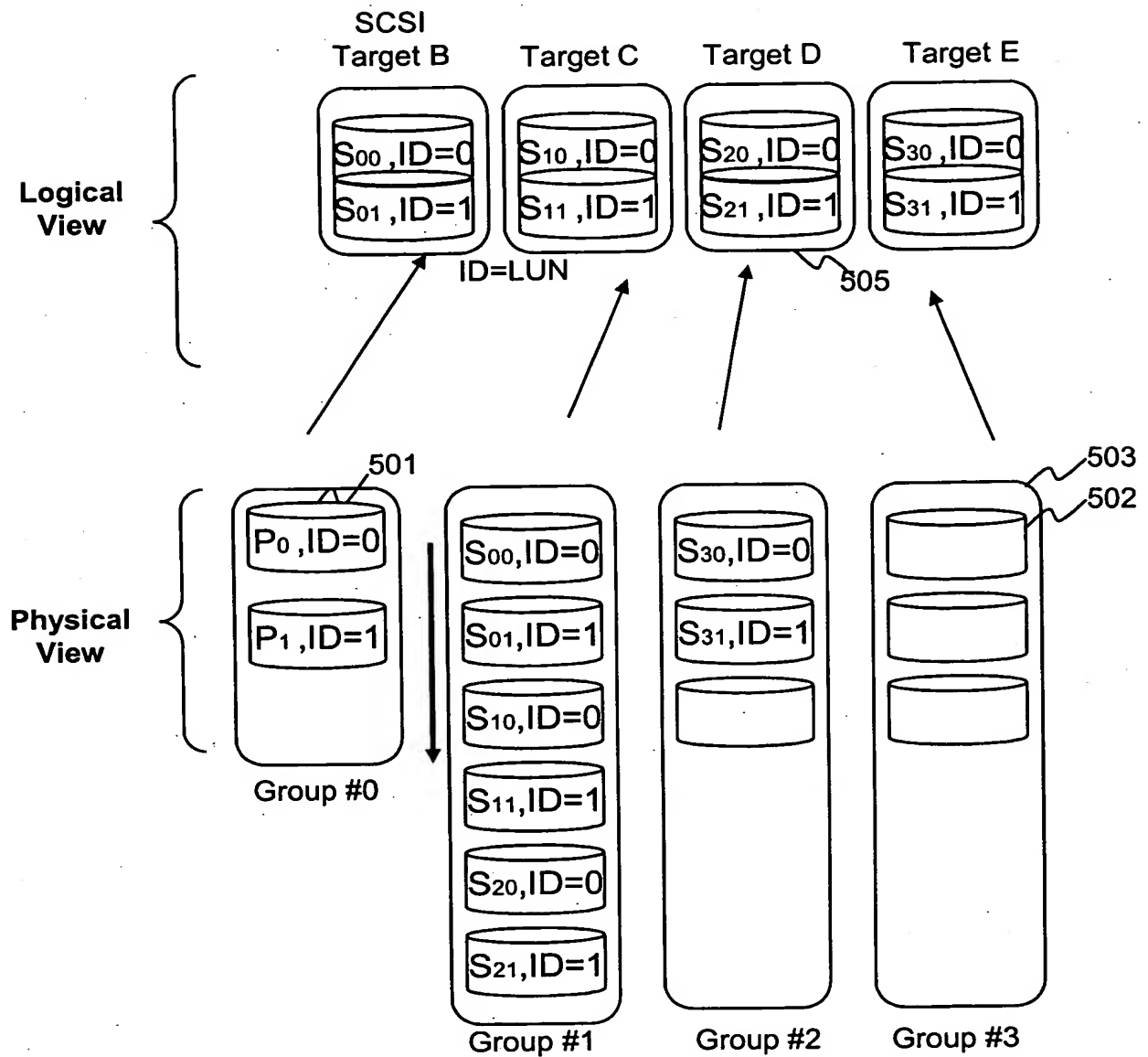


Figure 5 Layout - Vertical

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| Site Gr. ID | Site | Dpt Gr. ID | Dpt | Sys Gr. ID | Subsystem |
|-------------|------------|------------|------------|------------|----------------|
| S0 | NYC | S0D0 | Account | S0D0S0 | Hitachi 9900-1 |
| | | S0D1 | Develop #1 | S0D1S0 | Hitachi 9900-2 |
| | | S0D2 | Develop #2 | S0D2S0 | Hitachi 9900-3 |
| | | | | S0D2S1 | Hitachi 9500-1 |
| S1 | SJC | S1D0 | Develop #3 | S1D0S1 | Hitachi 9900-3 |
| S2 | SFO, Buld1 | S2D0 | Develop #4 | S2D0S0 | Hitachi 9900-4 |
| S3 | SFO, Buld2 | S3D0 | Develop #5 | S3D0S0 | Hitachi 9900-5 |

(a) Site group table

| Controller | Number of Ecc gr. |
|------------|----------------------|
| C0 | 4 |
| C1 | 6 |
| C2 | 4 |
| C3 | 4 |

(b) Controller group Table

| Ecc Gr | Capacity | Used | Disk drive | Type |
|--------|----------|--------|---------------------|--------------|
| C0E0 | 280 GB | 100 GB | SCSI 72GB, 10000rpm | 2D+2P, RAID1 |
| C0E1 | 420 GB | 200 GB | SCSI 140GB, 7200rpm | 3D+1P, RAID5 |
| C0E2 | 420 GB | 150 GB | SCS 140GB, 7200rpm | 3D+1P, RAID5 |
| C0E3 | 280 GB | 50GB | ATA 140GB, 7200rpm | 2D+2P, RAID1 |

(c) Ecc group Table

Figure 6 Group Table

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| Volume ID | Attribute | Pair ID |
|-----------|-------------------------|--------------------------|
| V000 | SCSI Target A, LUN=0 | P001,P002, P003, P004 |
| V001 | SCSI Target B, LUN=0 | NULL |
| V002 | NULL | NULL |
| V003 | NULL | NULL |
| V004 | NULL | NULL |

(d) Logical volume configuration

| | |
|-------------|-----------------|
| Group ID | S0D0S0 |
| Group Type | Subsystem |
| Name | Hitachi 9900-1 |
| Capacity | 10TB |
| Used Cap. | 5TB |
| Reliability | High |
| Perf [IO/s] | 2500 IO/s (10%) |
| Perf [MB/s] | 20MB/s (5%) |

(e) Group Information

Figure 6 Group Table

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| Pair | Type | Source | Dist | Status | Perf |
|------|-------------------|--------------------|---------------------|-------------------------------|----------------------|
| P001 | Local | S0D0S0 C0E0V000 | S0D0S0 C0E1V 000 | Sync | 2000 IO/s 8 MB/s |
| P002 | Local | S0D0S0 C0E0V000 | S0D0S0 C0E2V 000 | Suspend (2002/10/10 10:00) | 500 IO/s 30-MB/s |
| P003 | Local | S0D0S0 C0E0V000 | S0D0S0 C0E3V 000 | Suspend (2002/10/11 10:00) | 100 IO/s 400 KB/s |
| P004 | Local | S0D0S0 C0E0V000 | S0D0S0 C0E1V 001 | Suspend (2002/10/12 10:00) | 200 IO/s 800 KB/s |
| P005 | Remote (Async) | S0D0S0 C0E0V003 | S1D0S0 C0E1V 003 | Sync | 200 IO/s 800 KB/s |

710

Figure 7 Pair Configuration

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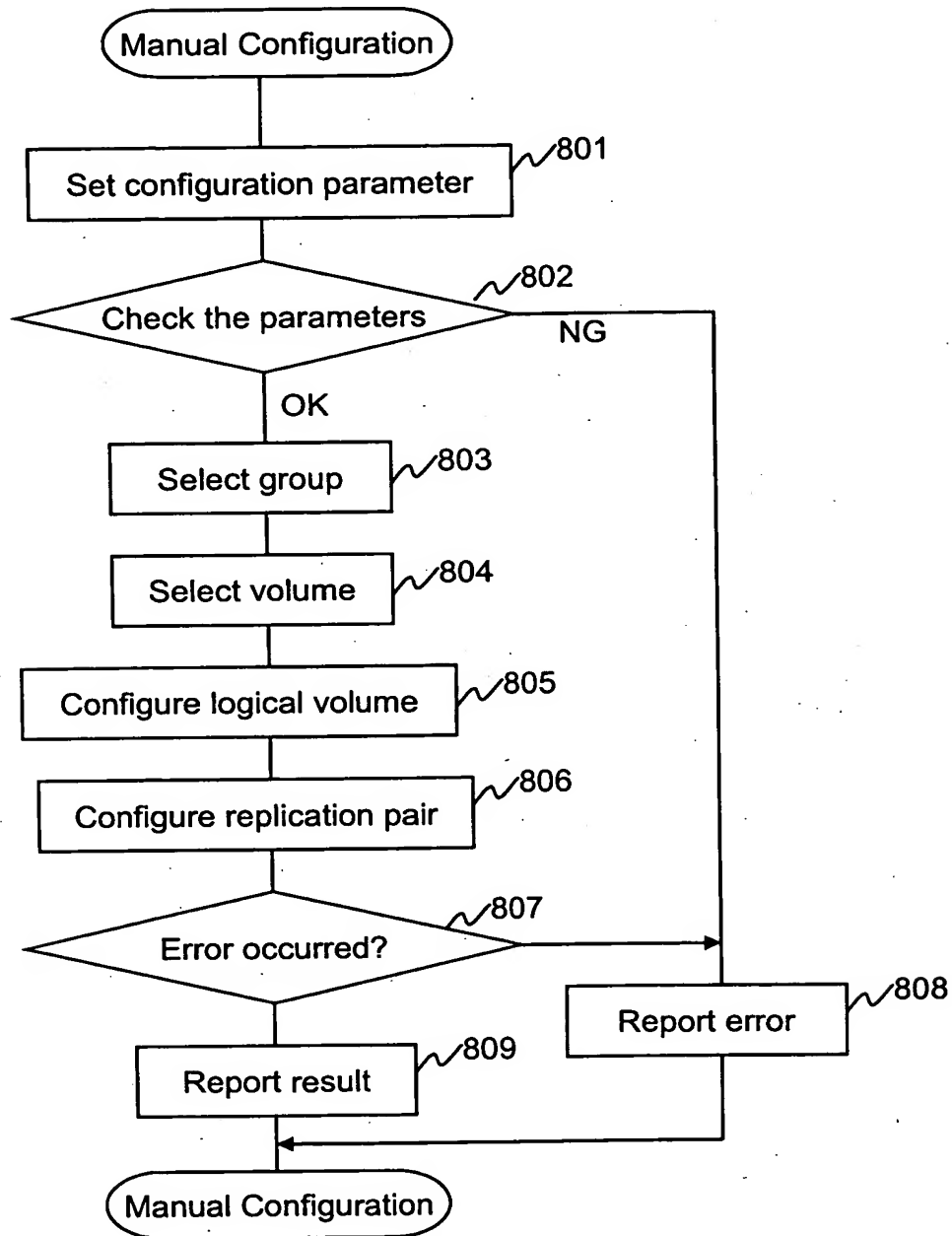


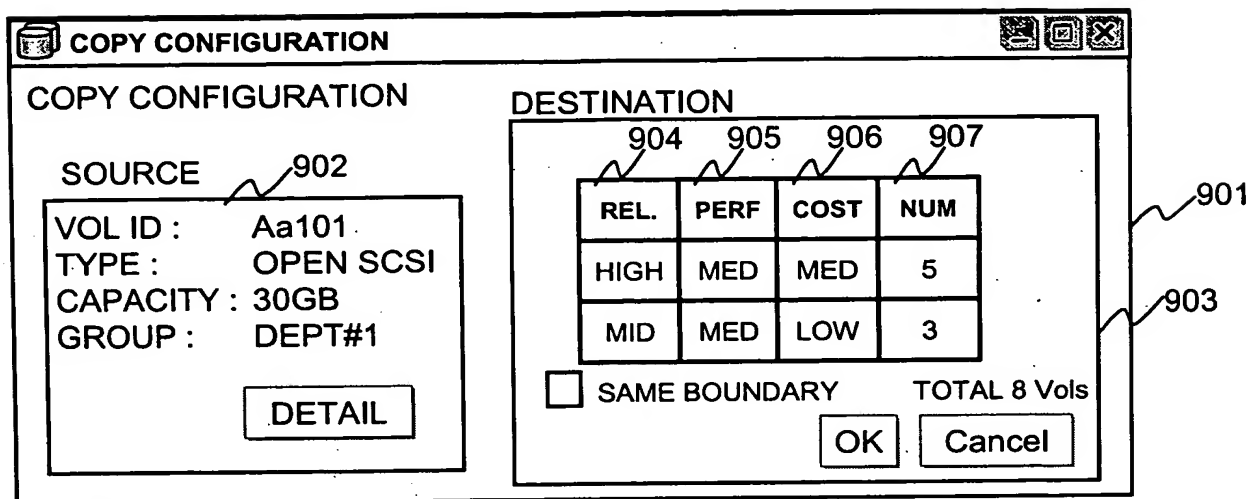
Figure 8 Manual Configuration

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The diagram shows a window titled "COPY CONFIGURATION" with a standard Windows-style title bar. It is divided into two main sections: "SOURCE" and "DESTINATION".

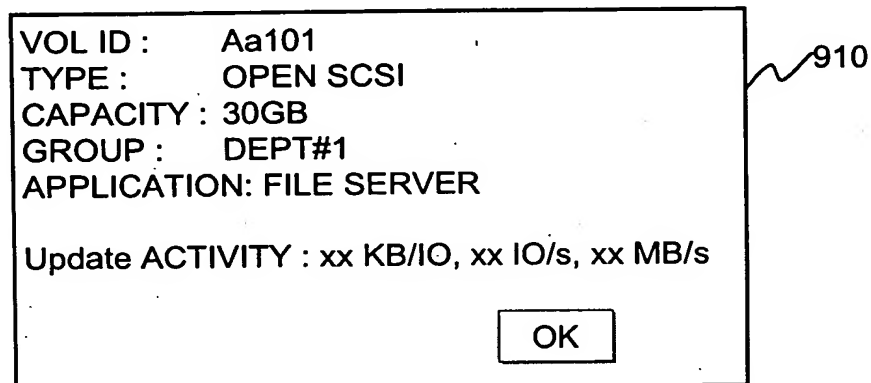
SOURCE (902): Contains the following text:
VOL ID : Aa101
TYPE : OPEN SCSI
CAPACITY : 30GB
GROUP : DEPT#1
Below this text is a button labeled "DETAIL".

DESTINATION (901): Contains a table with four columns labeled 904, 905, 906, and 907. The table has three rows of data.

| 904 | 905 | 906 | 907 |
|------|------|------|-----|
| REL. | PERF | COST | NUM |
| HIGH | MED | MED | 5 |
| MID | MED | LOW | 3 |

Below the table is a checkbox labeled "SAME BOUNDARY" and the text "TOTAL 8 Vols". At the bottom right of the DESTINATION section are two buttons: "OK" and "Cancel".

(a) Manual configuration window



The diagram shows a dialog box titled "Source information" (910). It contains the following text:
VOL ID : Aa101
TYPE : OPEN SCSI
CAPACITY : 30GB
GROUP : DEPT#1
APPLICATION: FILE SERVER

Update ACTIVITY : xx KB/IO, xx IO/s, xx MB/s
At the bottom right is an "OK" button.

(b) Source information

Figure 9 GUI #1 Manual Configuration

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COPY CONFIGURATION

COPY CONFIGURATION : BOUNDARY SETTING

| | Vols | |
|---|------|--------|
| <input type="checkbox"/> Other Gr. | 160 | 4 Gr.s |
| <input type="checkbox"/> Logical Gr. | 140 | 3 Subs |
| <input checked="" type="checkbox"/> Subsystem | 60 | 3 Ctl |
| <input type="checkbox"/> Controller | 20 | 4 Eccs |
| <input type="checkbox"/> Ecc Group | 5 | |

OK Cancel

1002 1001

Figure 10 GUI #2 Manual Configuration

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COPY CONFIGURATION



COPY CONFIGURATION

Subsystem ID = S0D2S0

| | Ctl | Vols | |
|-------------------------------------|-----|------|--------|
| <input checked="" type="checkbox"/> | B | 20 | DETAIL |
| <input checked="" type="checkbox"/> | C | 20 | DETAIL |
| <input checked="" type="checkbox"/> | D | 20 | DETAIL |

Addressing

☐ Vertical ☒ Horizontal

OK Cancel

1101 1101 1102

Figure 11 GUI #3 Manual Configuration

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The screenshot shows a window titled "USER GROUP" with a standard Windows-style title bar. Inside, the text "USER GROUP CONFIGURATION" is at the top. Below it is a form with two main sections. The first section contains fields for "NAME : ACCOUNTING", "ID : 00", and "TYPE : OPEN SCSI". Below these are three rows of settings: "RELIABILITY: HIGH", "PERFORMANCE : MED", and "COST : LOW". The second section is labeled "REPLICATION POLICY" and contains the text "WEEKLY BACKUP". At the bottom right are "OK" and "Cancel" buttons. Hand-drawn squiggly lines with numbers point to specific elements: 1201 points to the right side of the dialog, 1202 points to the "RELIABILITY" setting, 1203 points to the "REPLICATION POLICY" section, and 1204 points to the "OK" button.

USER GROUP

USER GROUP CONFIGURATION

NAME : ACCOUNTING
ID : 00
TYPE : OPEN SCSI

RELIABILITY: HIGH
PERFORMANCE : MED
COST : LOW

REPLICATION POLICY
WEEKLY BACKUP

OK Cancel

1201 1202 1203 1204

(a) User Group

The screenshot shows a window titled "APPLICATION CONFIGURATION" with a standard Windows-style title bar. Inside, the text "APPLICATION CONFIGURATION" is at the top. Below it is a form with two main sections. The first section contains fields for "NAME : ACCOUNT DB", "ID : 00", and "TYPE : OPEN SCSI". Below these are three rows of settings: "RELIABILITY: HIGH", "PERFORMANCE : HIGH", and "COST : HIGH". The second section is labeled "REPLICATION POLICY" and contains the text "DISASTER RECOVERY" and "DAILY BACKUP". At the bottom right are "OK" and "Cancel" buttons. Hand-drawn squiggly lines with numbers point to specific elements: 1210 points to the right side of the dialog, 1211 points to the "TYPE" field, 1212 points to the "REPLICATION POLICY" section, and 1213 points to the "OK" button.

APPLICATION CONFIGURATION

APPLICATION CONFIGURATION

NAME : ACCOUNT DB
ID : 00
TYPE : OPEN SCSI

RELIABILITY: HIGH
PERFORMANCE : HIGH
COST : HIGH

REPLICATION POLICY
DISASTER RECOVERY
DAILY BACKUP

OK Cancel

1210 1211 1212 1213

(b) Application Group

Figure 12 GUI #4 USER GROUP

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POLICY = FULL BACKUP HYBRID

SUB POLICY = DAILY BACKUP,
WEEKLY BACKUP

Application = Hitachi backup Manager

(a) FULL BACKUP

POLICY = DAILY BACKUP
ATTRIBUTE = REPLICATION

SPEED = HIGH
RELIABILITY = MID
COST = LOW

NUMBER OF VOLUMES = 6
COPY SPEED = HIGH

LOWER BOUNDARY = ECC
UPPER BOUNDARY = SUBSYSTEM
ADDRESSING = HORIZONTAL

(b) DAILY BACKUP

POLICY = WEEKLY BACKUP
ATTRIBUTE = REPLICATION

SPEED = HIGH
RELIABILITY = HIGH
COST = NULL

NUMBER OF VOLUMES = 1
COPY SPEED = HIGH

LOWER BOUNDARY = SUBSYSTEM
UPPER BOUNDARY = NULL
ADDRESSING = NULL

(c) WEEKLY BACKUP

Figure 13 POLICY FULL BACKUP

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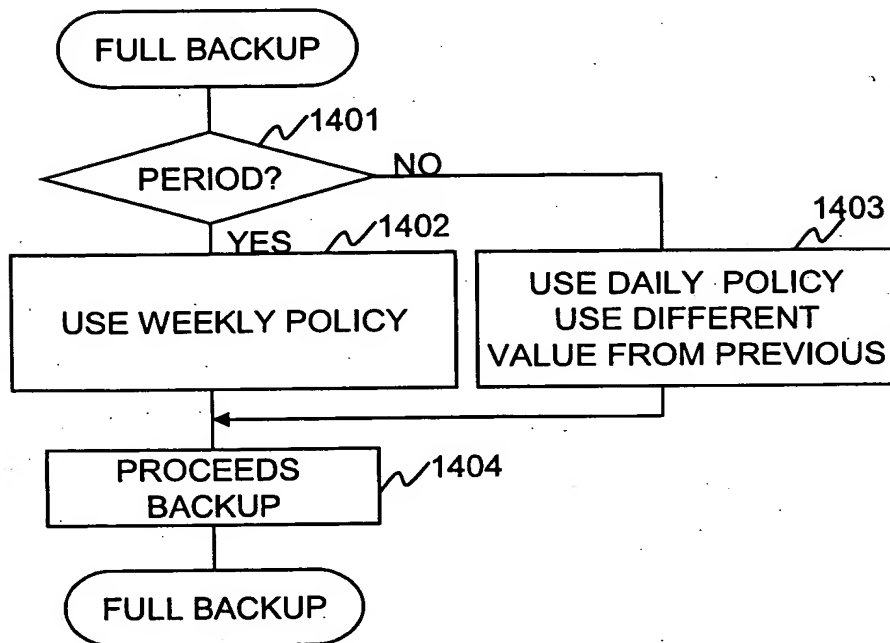


Figure 14 HYBRID BACKUP

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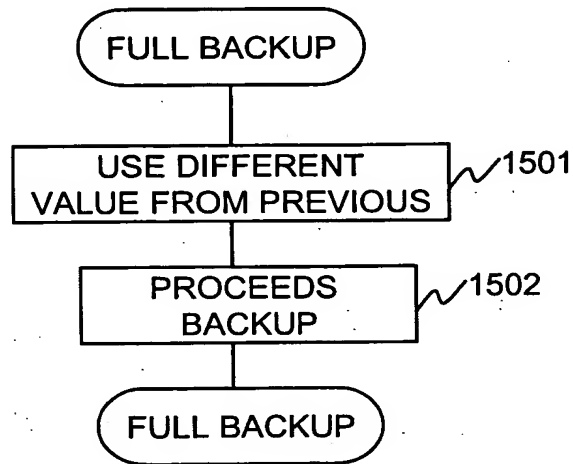


Figure 15 FULL BACKUP SCHEDULE

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POLICY = DIFFERENTIAL

SUB POLICY = DAILY BACKUP,
WEEKLY BACKUP

Application = Hitachi backup Manager

(a) DIFFERENTIAL BACKUP

POLICY = DAILY DIFFERENTIAL
ATTRIBUTE = ALONE

SPEED = HIGH
RELIABILITY = MID
COST = LOW

NUMBER OF VOLUMES = 6

LOWER BOUNDARY = ECC
UPPER BOUNDARY = SUBSYSTEM
ADDRESSING = HORIZONTAL

(b) DAILY BACKUP

POLICY = WEEKLY BACKUP
ATTRIBUTE = REPLICATION

SPEED = HIGH
RELIABILITY = HIGH
COST = HIGH

NUMBER OF VOLUMES = 2
COPY SPEED = HIGH

LOWER BOUNDARY = ECC
UPPER BOUNDARY = SUBSYSTEM
ADDRESSING = HORIZONTAL

(c) WEEKLY BACKUP

Figure16 DIFFERENTIAL BACKUP

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POLICY = DIFFERENTIAL

SUB POLICY = DAILY BACKUP,
WEEKLY BACKUP

Application = Hitachi backup Manager

(a) DIFFERENTIAL BACKUP

POLICY = DAILY DIFFERENTIAL
ATTRIBUTE = ALONE

SPEED = HIGH
RELIABILITY = MID
COST = LOW

NUMBER OF VOLUMES = 2
COPY SPEED = HIGH

LOWER BOUNDARY = ECC
UPPER BOUNDARY = SUBSYSTEM
ADDRESSING = VORIZONTAL

(b) DAILY BACKUP

POLICY = WEEKLY BACKUP
ATTRIBUTE = REPLICATION

SPEED = HIGH
RELIABILITY = HIGH
COST = HIGH

NUMBER OF VOLUMES = 2
COPY SPEED = HIGH

LOWER BOUNDARY = ECC
UPPER BOUNDARY = SUBSYSTEM
ADDRESSING = HORIZONTAL

(c) WEEKLY BACKUP

Figure 17 DIFFERENTIAL BACKUP

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POLICY = DISASTER RECOVERY

SPEED = HIGH

RELIABILITY = HIGH

COST = HIGH

NUMBER OF VOLUMES = 1

COPY SPEED = LOW (USER DEFINED)

LOWER BOUNDARY = SITE

UPPER BOUNDARY = NULL

ADDRESSING = NULL

Figure 18 Disaster Recovery